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Abstract

Technology Selection and Validation on New Millennium Flight Projects

C. Minning, M. Buehler, T. Fujita, F. Lansing, G. Man, and C. Stevens
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, CA 91109

The New Millennium Program (NMP) is devoted to advancing the introduction of new technology into flight systems by demonstrating their flight worthiness through a series of demonstration flights. To date three NMP flights have been launched (DS1, DS2, and EO1) and two others (DS5 and EO-3) are in the planning stages. The process by which the technologies were chosen is complex for many factors have to be considered. This paper provides a brief description of the current NMP flights and discusses the procedures used for selecting and validating their associated technologies.

In the past, advanced technologies were inventoried by Integrated Product Development Teams (IPDTs) which specialized in six technology areas: Autonomy, Structures, Avionics, Sensors, Instruments, and Telecommunication. More recently, the technology inventory process has been managed by the NASA Cross Enterprise Technology Development Program. This has allowed the NMP to consider a wider selection of technologies for its flight projects. This new selection process has been applied to the selection of technologies for the ST5 and EO-3 projects. The flight selection criteria continue to evolve and are currently formulated based on three factors:

1. Environmental Factor (Ground Test Impossible): These technologies are the ones that can not be adequately tested, simulated or modeled on the ground. Therefore, they have high risk for inclusion in operational systems and thus are prime candidates for flight validation.

2. Interdependency/Complexity Factor (Combined Effects): Complex technologies consist of assemblies of technologies whose components might be adequately ground tested but the assembly or system can not be adequately ground tested. Testing becomes complex when components interact or cross talk and this results in a large number of tests. Testing is further compounded when complex systems have autonomous control.

3. Perceived Risk Factor (Risk Reduction via Flight): Technology is often deemed unacceptable for space flight if the technology has not previously been flown and its reliability is unknown. Also included in this category are those technologies where there is a paradigm shift in the manufacturing or development procedures. Thus, task managers are unwilling to include such technologies in their projects until the new technology has been demonstrated to have a tolerable risk/reliability when flown.

These factors will be discussed and illustrated with a number of examples taken from past and current NMP flight projects.